

HOMEWORK 3

Due date: February 29, 2016, 11:55PM.

Bibliography: Course lecture notes Lessons 12-14. Textbook pp. 12-30, 218-246, Sections 1.3-1.4, 5.1-5.3. Feel free to use Octave within the theoretical exercises to avoid tedious arithmetic.

1. (1 course point) Textbook p.19, Exercise 1.3.22
2. (1 course point) Textbook p.30, Exercise 1.4.19
3. (1 course point) Textbook p.231, Exercise 5.2.1
4. (1 course point) Textbook p.247, Exercises 5.3.27
5. (Computer application 4 course points) We continue investigation of realistic applications using image analysis. Use the same image data base you used in Homework 2 for the following tasks,
Task 1. (2 course points). Use the QR factorization to orthonormalize the images (columns of matrix \mathbf{A}), and show the resulting images. Comment on the result (e.g., for the face recognition example, are the images resulting from orthonormalization what you would characterize as faces?)
Task 2. (2 course points). Choose an image (represented by vector \mathbf{u}) not included in the database (not in the chosen columns for \mathbf{A}). The image can be decomposed as $\mathbf{u} = \mathbf{v} + \mathbf{w}$, with $\mathbf{v} \in C(\mathbf{A})$, $\mathbf{w} \in N(\mathbf{A}^T)$. Compute \mathbf{v} , \mathbf{w} and show the results. Repeat for an additional 3 images. Comment on the results.